

The book is wonderfully free from misprints, at least of a serious character, and on the whole the book is one which can be highly recommended to all students who wish to obtain a first acquaintance with the subject of physical chemistry. In language it is clear and well-expressed, and the practical illustrations which are appended to most of the chapters will be found very useful for laboratory work. The cost of the book, also, is extraordinarily low. A grave omission on the part of the publishers is the date of publication on the title-page.

A. F.

ELECTRICAL ENGINEERING.

- (1) *Transformers, for Single and Multiphase Currents. A Treatise on their Theory, Construction, and Use.* By Prof. Gisbert Kapp. Second, revised and enlarged edition. Pp. ix+363. (London: Whittaker and Co., 1908.) Price 10s. 6d. net.
- (2) *Electrical Engineer's Pocket Book. A Handbook of Useful Data for Electricians and Electrical Engineers.* By Horatio A. Foster, with the Collaboration of Eminent Specialists. Fifth edition, completely revised and enlarged. Pp. xxxvi+1599. (London: A. Constable and Co., Ltd., 1908.) Price 21s. net.

(1) A NEW edition of Prof. Kapp's well-known book on transformers is bound to be interesting to all electrical engineers. Moreover, when the new edition is so much enlarged as to become practically a new book, the publication is of still greater importance.

The first two chapters are introductory in character, and deal respectively with general principles and with the losses in transformers. We cannot but feel some regret that the constants for hysteresis loss are not given in the form $K \times B^{1.5}$. This form gives practically the same result as the $B^{1.6}$ formula if a suitable value of K is chosen (as Prof. Kapp states on p. 17), and the calculation of the loss if the index is 1.5 can be much more readily made. The second chapter includes some valuable results of tests on the newer alloyed irons.

One of the best of the new chapters is chapter iii., where the subject of heating of transformers is dealt with very completely. The method of estimating temperature rise graphically for intermittent loads by combining the heating and cooling curves is very clearly given. Chapter v. is a very interesting one, dealing with the much neglected subject of the design of choking coils; the method of determining the necessary volume of the air-gap to give a certain amount of wattless current is both novel and useful.

In chapter vi. the design of the core of a transformer is considered, and a good deal of space is devoted to the discussion of the distribution of losses in a transformer. Some exception must be taken to the statement on p. 123:—

"The law of equal losses gives the maximum efficiency of a transformer which is the right size for the load. Arnold's law¹ gives it for a transformer which is slightly too large for the load."

¹ Copper loss = 0.8 hysteresis loss + eddy current loss.

Arnold's law and the law of equal loss are obtained on totally different premises, and both laws are correct for the given premises. It is true also that for a transformer designed on Arnold's law a higher efficiency can be obtained by increasing the load until the copper loss is equal to the iron loss, but this load may be more than the transformer can stand, and it is no more accurate to say that Arnold's law gives maximum efficiency for a transformer that is slightly too large for its load than it would be to say that the law of equal losses gives the maximum efficiency for a transformer that is slightly too small for its load.

In chapter vii. the design of a shell transformer is worked out in detail. One must enter a protest against the introduction of "Fill Factor." This is a literal translation of the German "Füllfaktor," but the English "Space Factor," introduced by Thompson, is now so well recognised that it seems a pity to use another term.

In chapter viii. the transformer theory is worked out in the same clear way as is done in the earlier edition. Prof. Kapp's well-known diagrams are described in detail, as well as the simplified drop diagram now so largely used. In the next chapter the calculation of magnetic leakage is considered, and some useful formulæ are given for calculating it in specific cases.

Chapter x. deals with the measurement of power; the usual methods of measuring power are described, including the three amperemeter and three voltmeter methods. Students might perhaps have been warned of the great accuracy of measurement in voltage and current which is necessary to obtain good results with these two methods. Chapter xi. deals with the testing of transformers, and includes also a description of most of the modern iron-testers, including the Epstein tester for total loss, the Grassot fluxometer, and Prof. Kapp's device for measuring magnetic quality.

The next chapter deals with a number of subjects, including safety appliances for transformers, three-wire transformers, auto-transformers, series working, and Scott's system of transformation from two-phase to three-phase working. It is similar to the corresponding one in the earlier edition, though the matter is greatly increased and brought up to date.

The last chapter gives some examples of modern single-phase and three-phase transformers, and is one of the most valuable in the book, both for the student and the designer. Not only are many plates and drawings included, but the details of the designs are worked out in many cases.

This book is likely to remain a standard treatise on the subject in English for some time.

(2) The "Electrical Engineer's Pocket Book" is similar to many other pocket books of the same class already on the market. It aims, however, at giving more complete and comprehensive information than most of these compilations, and deals with such subjects as electrochemistry, illuminating engineering, electrolytic action, firing mechanism for guns, electro-metallurgy and X-rays, while more than 250 pages

are devoted to electric railways. The method of giving two tables for the same constant in two separate parts of the book is open to much criticism, and there are one or two obvious mistakes. In the description of the Weston cadmium cell, for example, the elements are stated to be cadmium and mercury instead of cadmium amalgam and mercury, while in the table of specific inductive capacities on p. 227 the specific inductive capacity of gutta-percha is given as 2.5, whereas on p. 36 we have the proper value of from 3.3-4.9. The whole of the table on p. 227 might well be omitted. Apart from a few minor defects, which it is very difficult to avoid in a compilation of this kind, the tables appear to be trustworthy, and are readily referred to by the aid of an excellent and complete index. E. W. M.

FOOD AND NUTRITION.

Human Foods and their Nutritive Value. By H. Snyder. Pp. xvi+362. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1908.) Price 5s. net.

OUR author remarks that the study of foods is "the oldest, most important, most neglected, and least understood of any that have a direct bearing upon the welfare of man."

No doubt there has been, and still is, neglect of systematic and coordinated scientific investigation into the many problems which arise in connection with the task of nourishing the human body. Yet a vast amount of work has been done on the subject. The list of books referred to in the present volume reaches the respectable total of one hundred. True, many of them—as, for example, the "Bulletins" of the United States Department of Agriculture—are only short studies of isolated points, but, on the other hand, the list is chiefly confined to American works, and is not intended to be a complete bibliography. Perhaps the indications point not so much to general neglect as to the present stage being one of accumulating evidence. By and by, it may be, some dietetic Kepler will discover laws of nutrition which will coordinate the facts better than can yet be done. Meanwhile, distinct progress is being made.

The opening chapter of the volume is devoted to expounding the general composition of foods. It describes how they are made up of water, inorganic salts, and organic compounds, and how the latter may consist of proteids and fats, starches, sugars, pectose, cellulose, and so on. After explaining the changes which foods undergo during cooking, the author passes to a consideration of the various classes of foods—e.g. vegetables, fruits and flavourings, milk and other dairy products, meat-foods, cereals, condiments, and beverages. In each case a short description of the article is given, indicating its composition as regards nutrient substances and, generally, its value as a food. Tables are appended which show, for ordinary American foodstuffs, the proportion of non-edible refuse, water, protein, fat, carbohydrates, and ash, together with the heat-equivalents of the foods.

Naturally in so small a book the information is often meagre, but it appears to be generally trustworthy. The treatment, though elementary, should serve to make the work a good introduction to the study of dietetics.

Probably the sections dealing with the digestibility of foods and with dietary studies will be found the most interesting. The author distinguishes between the completeness and the ease of digestion, and summarises the factors which influence the two as (1) combination of foods, (2) amount, (3) method of preparation, (4) mechanical condition of the food, (5) its palatability, (6) its physiological properties, such as astringency and laxativeness, (7) the individuality of the consumer, and (8) psychological influences—e.g. preconceived ideas as to the wholesomeness or otherwise of the food. On such questions as vegetarianism, the use of "whole-meal" bread, and heavy meat diets, Mr. Snyder takes a moderate and reasoned attitude. As regards the last, he maintains that at present the available results are too meagre to justify the formulation of other than tentative standards. "In the matter of diet," he says, quoting Hutchison's "Food and Dietetics," "every man must, in the last resort, be a law unto himself . . . giving due heed to the warnings which nature is sure to address to him should he at any time transgress."

C. SIMMONDS.

THE BODY AT WORK.

The Body at Work. A Treatise on the Principles of Physiology. By Dr. Alex. Hill. Pp. xi+448. (London: Edward Arnold, 1908.) Price 16s. net.

DR. HILL has given us a book at once instructive and attractive. He writes for the amateur in science, but men deeply versed in physiology will find much to interest and to learn in his work. There is not a sentence in the book that could be spared, yet, although the reading commands close attention, it never fails to attract and to please. After a preliminary review of the subject of physiology, the second chapter, on the basis of life, reminds one of the great man whose name appears in the first line of the chapter, for "The Body at Work" is quite in the style of Huxley at his best.

The subject is approached from the unit of structure—the cell—through its groupings and specialising of structure and function to form the higher tissues and organs. The importance of the leucocytes, their manner of travelling, of multiplying, and of grouping, is graphically told, and the sections devoted to the blood and circulation in chapters iv. and ix. are simply but most explicitly handled. Amateurs in science can peruse with understanding the abstruse subjects of the functions of the thyroid gland, the suprarenal capsules, and the pituitary body. Digestion and dietetics, respiration in all its bearings, absorption and excretion are given in language that reads almost like a fairy-tale, yet with a scientific accuracy and bearing wholly trustworthy.

Throughout the book the meaning of vital processes is brought out in a fashion which leaves its impress.